

**Claims**

What is claimed is:

1. A diagnostic testing system for a vehicle comprising:
  - an oxygen sensor;
  - an analyzer having a user interface;
  - a communications link between said analyzer and said vehicle to obtain data from said oxygen sensor;
  - a diagnostic heuristic to analyze said data and confirm proper operation of said sensor; and
  - an output generated by said diagnostic heuristic to said user interface including the results generated by said diagnostic heuristic.
2. A diagnostic testing system as in claim 1, wherein said data from said oxygen sensor includes a voltage.
3. A diagnostic testing system as in claim 2, wherein said voltage ranges between an upper voltage and a lower voltage in a generally sinusoidal manner over time, said diagnostic heuristic using said voltage in combination with said time to analyze said sensor.
4. A diagnostic testing system as in claim 3, wherein a time period is measured between one of said upper and lower voltages and the other of said upper and lower voltages and said diagnostic heuristic uses said time period to analyze said sensor.
5. A diagnostic testing system as in claim 4, wherein said data includes engine throttle position obtained generally concurrently with said data from said oxygen sensor such that engine throttle position can be correlated with said data from said oxygen sensor over said time period.

6. A diagnostic testing system as in claim 3, wherein a cross-count voltage is established between said upper voltage and said lower voltage, and wherein a time period is set and the number of counts measured where said voltage matches said cross-count voltage within said time period.

7. A diagnostic testing system as in claim 6, wherein said data includes engine RPM obtained generally concurrently with said data from said oxygen sensor such that engine RPM can be correlated with said data from said oxygen sensor over said time period.

8. A diagnostic testing system as in claim 2, wherein said data is collected over a predetermined time for use by said diagnostic heuristic.

9. A diagnostic testing system as in claim 2, wherein said diagnostic heuristic includes a set of instructions presented through said user interface.

10. A diagnostic testing system as in claim 9, wherein a first set of instructions includes pre-validation system check.

11. A diagnostic testing system for a running vehicle having an internal combustion engine comprising:

an oxygen sensor received within the exhaust stream of the vehicle;

an analyzer having a user interface;

a communications link between said analyzer and said vehicle to obtain data from said oxygen sensor, and wherein said data from said oxygen sensor includes a voltage, said voltage ranging between an upper voltage and a lower voltage in a generally sinusoidal manner over a time period;

a diagnostic heuristic to analyze said data and confirm proper operation of said sensor, said diagnostic heuristic using said voltage in combination with said time period to analyze said sensor; and

an output generated by said diagnostic heuristic to said user interface.

12. A diagnostic testing system as in claim 11, wherein a first time period is measured between one of said upper and lower voltages and the other of said upper and lower voltages and said diagnostic heuristic uses said first time period to analyze said sensor, wherein said sensor passes a first test if said first time period is within a pre-set threshold.

13. A diagnostic testing system as in claim 12, wherein if said first time period is within said pre-set threshold, then a cross-count voltage is established between said upper voltage and said lower voltage, and wherein a second time period is set and the number of counts measured where said voltage matches said cross-count voltage within said time period such that said sensor passes a second test if said number of counts is within a pre-set threshold.

14. A diagnostic testing system as in claim 13, wherein prior to said first test, said system includes pre-test validation, said pre-test validation including confirming sensor communication; module indicator light and diagnostic trouble code analysis; engine RPM; and sensor temperature.

15. A diagnostic testing system as in claim 14, wherein sensor temperature is determined as a function of coolant temperature.

16. A method for diagnostic testing of an oxygen sensor within a vehicle, the method comprising:

configuring a user interface in communication with a software system;  
configuring a communications link in communication with said software system;  
said software system communicating with an oxygen sensor;  
conducting a pre-validation test using said software system; and  
conducting a diagnostic test of said oxygen sensor using said software system.

17. The method of claim 16, wherein said pre-validation test further includes configuring an interface between said software system and an on-board vehicle computer system and conducting a pre-validation test for stored trouble codes in said on-board vehicle computer system.

18. The method of claim 16, wherein said pre-validation test further includes configuring an interface between said software and an on-board vehicle computer system and conducting a pre-validation test for sensor temperature.

19. The method of claim 16, wherein said reading of sensor temperature uses engine coolant temperature.

20. The method of claim 16, wherein said diagnostic testing of said oxygen sensor further includes collecting a plurality of voltage readings of said oxygen sensor over a set time period.

21. A method of claim 20, wherein said diagnostic testing of said oxygen sensor further includes the steps of:

setting a cross-count voltage;

determining a cross count value for said oxygen sensor based upon the number of times said voltage crosses said cross-count voltage over said time period; and

comparing said cross count value to a pre-set threshold to confirm operation of said sensor.

22. A method of claim 20, wherein said diagnostic testing of said oxygen sensor further includes the steps of:

establishing an upper voltage and a lower voltage;

measuring the time for said voltage to move between one of said upper voltage and said lower voltage and the other of said upper voltage and said lower voltage; and

comparing the time to a pre-set threshold to confirm operation of said sensor.